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Rock Chips

Fall 2007

Alberta Geological Survey

The Discovery Channel's Daily Planet Visits AGS

Between May 28 and June 1, the Discovery Channel's Daily Planet team visited Alberta to film stories on two separate Alberta Geological Survey (AGS) initiatives: The Turtle Mountain Monitoring Project and the Diamond Potential of Alberta.

On May 28, Roy Eccles of the AGS led a field trip to visit the K6 kimberlite exposure in the Buffalo Head Hills, north-central Alberta and provided the Discovery Channel team with a first-hand glimpse of diamond-bearing bedrock. This was followed by visits in Edmonton to the AGS office and the University of Alberta Rough Diamond Exhibit. The documentary hopes to promote awareness of the diamond potential of Alberta and the rest of Canada with a scientific emphasis.

An overhead shot of the K6 kimberlite exposure.

The Discovery Channel crew sets up for filming at the K6 kimberlite exposure in the Buffalo Head Hills.

EUB Alberta Energy and Utilities Board

AGS

On May 30, an AGS team of Corey Froese, Gordon Jean and Francisco Moreno led the Discovery Channel crew, via helicopter, to the South Peak of Turtle Mountain. The AGS team gave an overview of the rock slide hazard potential from South Peak, the emergency warning system and a detailed overview of the real-time sensor network located on the mountain. This was followed by a tour of the debris from the Frank Slide and an overview of the history of instability on Turtle Mountain.

Daily Planet crew and AGS staff filming on and around Turtle Mountain.

The Daily Planet producers plan to edit both segments during the summer for air times in the fall of 2007. Details as to show times and links to the web segments can be found on the AGS website at www.ags.gov.ab.ca once they are available.

Plans are also in the works for Daily Planet segments to be filmed on other AGS projects. Be sure to watch future issues of Rock Chips and the AGS website for more information. ❖

Rock Chips is published four times a year by the Alberta Geological Survey in the spring, summer, fall and winter.

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Past and present issues of *Rock Chips* may be viewed on the AGS website located at www.ags.gov.ab.ca.

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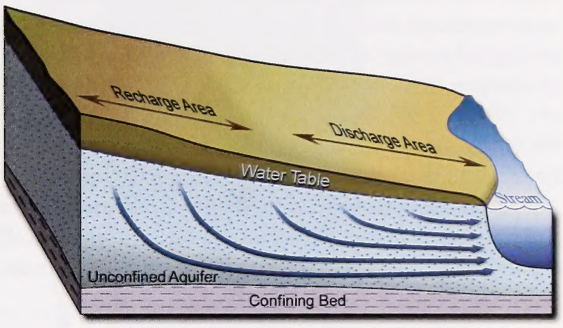
New Groundwater Mapping and Inventory Program Launched at AGS

A new groundwater mapping program has been launched at AGS. In partnership with Alberta Environment, this program will fill the need for modern mapping and groundwater inventory information in Alberta. The program will begin with a 3-year commitment to mapping groundwater in the fast-growing Edmonton-Calgary corridor. The program vision, however, is to extend map and inventory coverage across all Alberta in a timely manner.

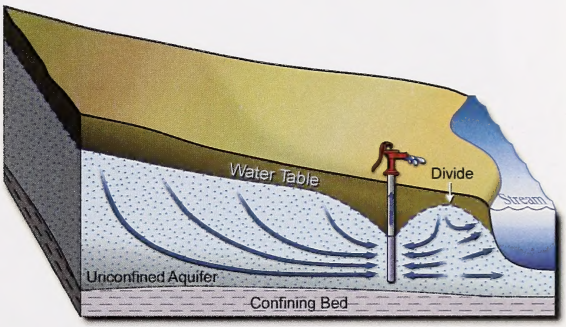
The program will be supported by the creation of a dedicated Groundwater Mapping and Inventory Section at AGS. This section will start with a staff complement of five full-time AGS staff. They will be joined by three full-time Alberta Environment hydrogeologists who will work directly out of AGS offices for the first part of the program. Operational funding for the first three years will be supported in large part by the Alberta Energy Innovation Fund. The program is being delivered in support of Alberta's Water Strategy.

Alberta's needs for groundwater information has been served by past mapping products. The original groundwater reconnaissance-map series created by the Groundwater Department of the Alberta Research Council from 1968-1978 provided near complete coverage of information related to possible groundwater yield and chemistry. The ongoing county-based groundwater assessment reports sponsored by the Prairie Farm Rehabilitation Agency (PFRA) provide single-source data reviews and maps for county and municipal planners. Both products are still available through the AGS Information Centre and at www.ags.gov.ab.ca/publications. Look for keywords 'hydrogeology' or 'groundwater' under both Earth Science Reports and Special Reports in our online catalogue.

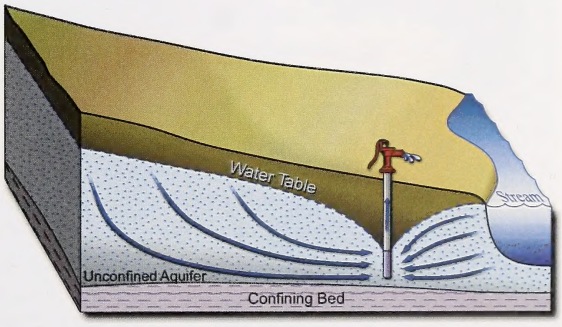
The new mapping and inventory initiative will be designed to meet the needs of the modern user of groundwater information. It aims to deliver current, digital and dynamic data and information through reports, maps and the website. As well, while datasets and maps are vital products of the program, it will take the needed step of moving to a quantitative, dynamic and spatially organized inventory of the stocks and flows in the groundwater resource. This inventory may ultimately be linked to regulatory and other processes for water-resource allocation and protection in Alberta. ❖



Resources inventory depends on understanding the dynamic response of natural conditions to pumping.



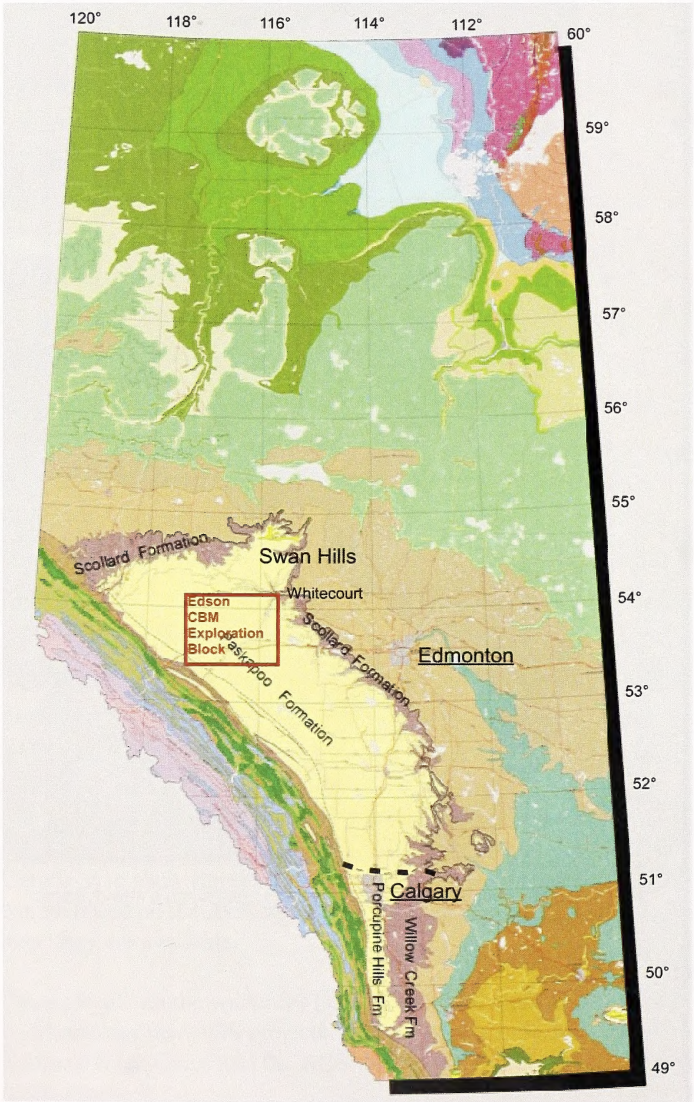
All groundwater developments initially mine groundwater...



...and ultimately do not as the system comes into a new dynamic equilibrium.

Edson CBM Exploration Block—Alberta, Ardley Coal Zone Characterization and Sandstone Channels Geometry

There is an increasing demand for natural gas from unconventional sources, and growing interest in geological storage of carbon dioxide (CO_2) in Alberta. Production of methane from coal (coalbed methane or CBM) is well established in the Horseshoe Canyon Formation, and continues to develop in the Mannville Group. The thick Ardley Coal Zone in west-central Alberta is being reviewed for CBM production potential and possibly injecting CO_2 into the coals to 'geologically capture' CO_2. This will enhance CBM production from wellbores by displacing methane at the same time.

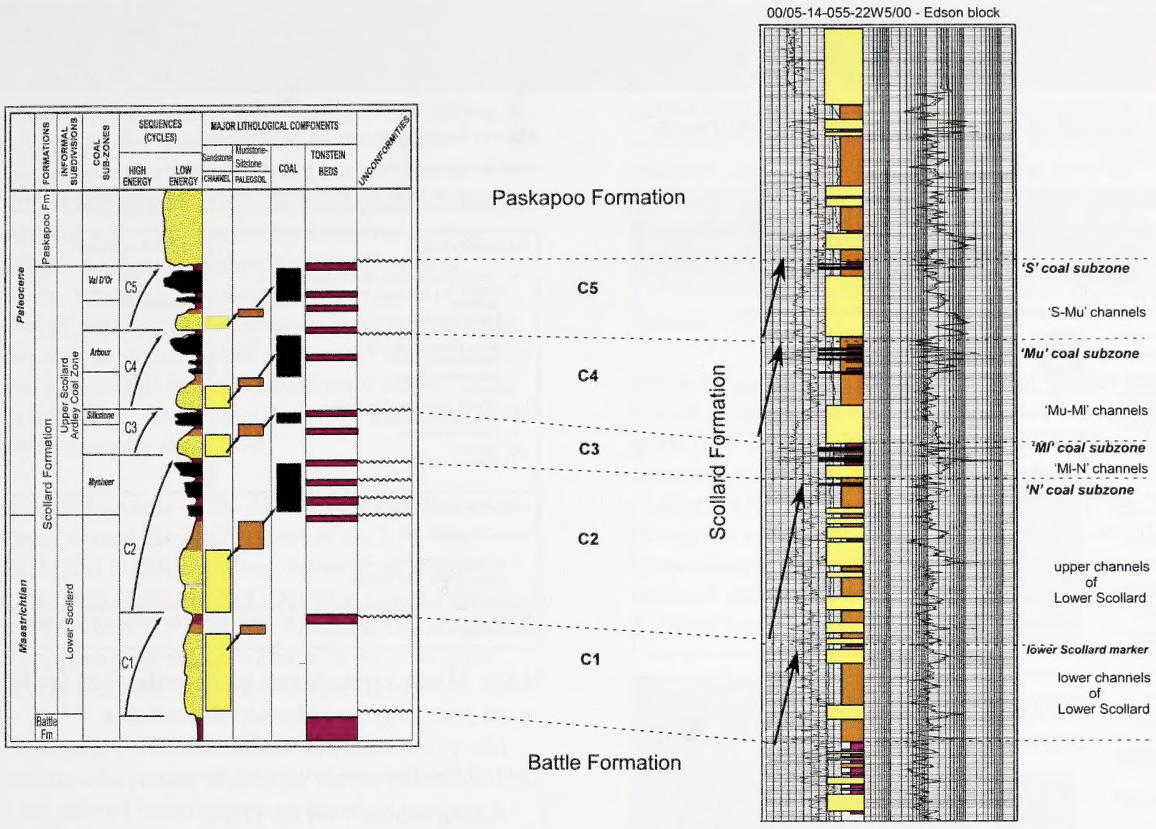


Edson study area on the Alberta bedrock map.

The Ardley Coal Zone (of the Scollard Formation) is particularly thick and continuous in two areas in central Alberta, the corridor between Drayton Valley and Rimby (Pembina area), and the Edson-Whitecourt corridor (Edson area). Key factors to understand CBM potential, which include geology, distribution, CBM generation potential and reservoir characteristics of the coals, as well as the distribution and possible connectivity of the coals and adjacent sandstones, have been investigated for these two areas. Study results from the Pembina area have been released as EUB/AGS Earth Sciences Report 2007-04. Results from the Edson area are summarized here and released in detail in EUB/AGS Earth Sciences Report 2007-06.

The report presents an overview based on new data from the Battle-Scollard-Paskapoo succession in the Edson CBM exploration block, including a new sequence stratigraphic model, which allows a realistic coal seam correlation in the Edson CBM exploration block. New lithological and stratigraphic data associated with formation pressure and water chemistry data have been systematically analyzed to delineate coal reservoir characteristics, including coal properties, coal zone internal structure, hydrogeology and fracture pattern, coal tonnage, and gas-in-place estimation. Distribution of fluvial channels within the Scollard-basal Paskapoo succession and the coal-channels architecture in the Edson block is described, emphasizing potential pathways of geo-fluid migration.

Five fluvial sequences and related coal development have been identified in the Edson block. These are interpreted as dynamic responses to cyclic, slow-thrusting tectonic stages followed by isostatic rebounding, with each event culminating in peat accumulation that resulted in the development of four distinct 'coal subzones.' The depositional environments favourable to coal accumulation migrated from the east-central part of the Edson coal sub-basin at the beginning of coal deposition time (lowermost 'N' subzone) to the west-central ('Ml' and 'Mu' subzones), and strongly to the southwest at the end of the Ardley deposition time (uppermost 'S' subzone). Each coal subzone can be considered an individual



Ardley coal zone correlation and sequence stratigraphic model between the Pembina (left) and Edson (right) CBM blocks.

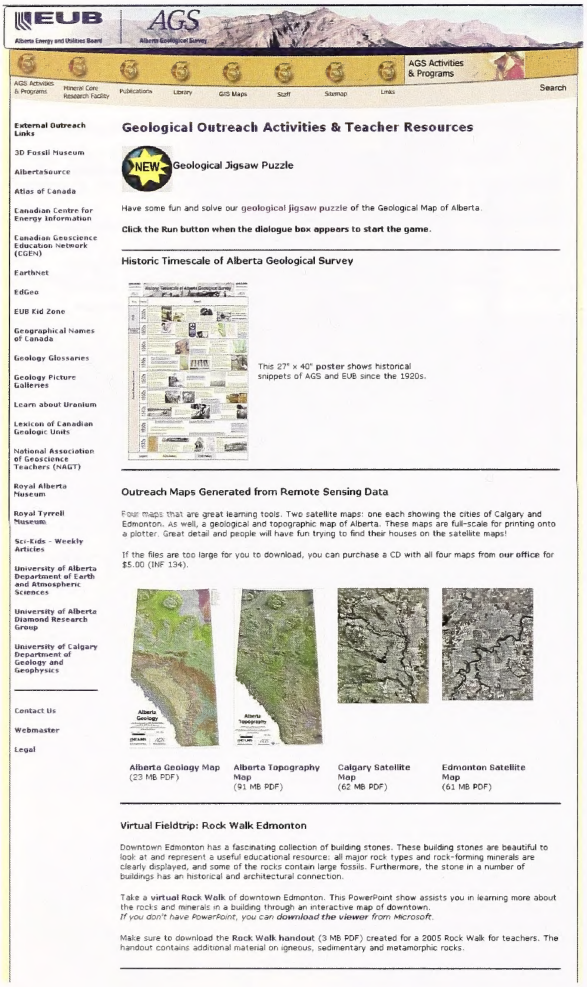
CBM reservoir due to its particular geometry and sealing characteristics.

Reservoir characteristics favourable to CBM production were observed within the Edson area coal seams. The thermal maturation (as indicated by vitrinite reflectance) is 0.54%–0.59%, which is within the onset of hydrocarbon generation. The examined drillcores have shown that the dominant type of coal in the Edson block is 'banded coal.' Banded coals have appropriate organic components to potentially generate CBM, and have the potential to develop natural fractures or cleats that can act as pathways for CBM to migrate within the seam into a wellbore for production. Observed cleats are open and generally free of mineral infillings. The regional fracture system suggests two areas of 'multiple coal cleat systems' northwest and southeast of the Athabasca River, which may have enhanced permeability conducive to production potential. Coal seam geometry suggests that differential compaction of the underlying sediments may have locally amplified existing cleats or generated additional fractures at the contact between coal seams and adjacent sandstone channels. An outcrop of overlying Paleocene Paskapoo sandstone channels shows the presence of post-lower Paleocene fractures.

Ardley Coal Zone total gas-in-place is estimated to be in the order of 1100 x 10^9 m^3 in the Edson block. Each of the lower three coal subzones ('N,' 'MI' and 'Mu') presents a consistent estimative content of gas of 300-330 x$10^9$$m^3$, whereas the uppermost coal subunit, 'S,' has less than 100 x10^9 m^3, mainly due to the substantial erosion of the uppermost coal strata. The sandstone channels and the underlying coal seams show direct stratigraphic contact in some locations, which may allow fluids to migrate under specific reservoir conditions. Both coal and sandstone types of reservoirs have inherent permeability. The stratigraphic contact of the two types of reservoirs infers reservoir connectivity and can be considered pathways for gas migration in CO_2 storage and enhanced coalbed methane production strategies. ❖

Check Out These Web Pages

www.ags.gov.ab.ca/activities/outreach/outreach.shtml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Have some fun and solve our geological jigsaw puzzle of the Geological Map of Alberta.
Click the Run button when the dialogue box appears to start the game.
Historic Timescale of Alberta Geological Survey
This 27" x 40" poster shows historical snippets of AGS and EUB since the 1920s.
Outreach Maps Generated from Remote Sensing Data
Four maps that are great learning tools. Two satellite maps: one each showing the cities of Calgary and Edmonton. As well, a geological and topographic map of Alberta. These maps are full-scale for printing onto a plotter. Great detail and people will have fun trying to find their houses on the satellite maps!
If the files are too large for you to download, you can purchase a CD with all four maps from our office for $5.00 (INF 134).
Alberta Geology Map (23 MB PDF)
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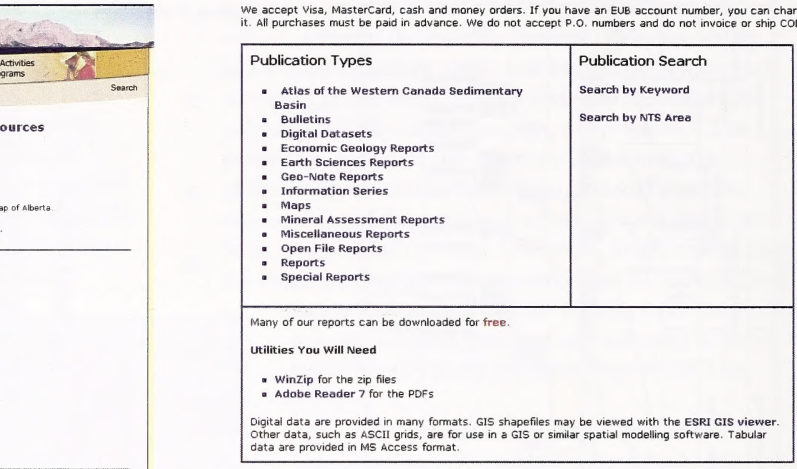
Virtual Fieldtrip: Rock Walk Edmonton
Downtown Edmonton has a fascinating collection of building stones. These building stones are beautiful to look at and represent a useful educational resource: all major rock types and rock-forming minerals are clearly displayed, and some of the rocks contain large fossils. Furthermore, the stone in a number of buildings has an historical and architectural connection.
Take a virtual Rock Walk of downtown Edmonton. This PowerPoint show assists you in learning more about the rocks and minerals in a building through an interactive map of downtown.
If you don't have PowerPoint, you can download the viewer from Microsoft.
Make sure to download the Rock Walk handout (3 MB PDF) created for a 2005 Rock Walk for teachers. The handout contains additional material on igneous, sedimentary and metamorphic rocks.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Dixon Edwards Awarded the E.R. Ward Neale Medal	Dixon Edwards	(780) 427-1516

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Dixon Edwards Awarded the E.R. Ward Neale Medal

The Neale Medal, named after the legendary geologist E.R. Ward Neale, is awarded by the Geological Association of Canada (GAC) to an individual for sustained outstanding efforts in sharing earth science knowledge with Canadians. The award recognizes outstanding efforts to communicate and explain geoscience to the public through one or more of the following vehicles: public lectures, print or electronic media articles, school visits, elementary and secondary school educational materials, field trips, science fairs, and other public communications. The medal has been awarded annually since 1995.

Mr. Dixon Edwards of the Alberta Geological Survey has been named the 2007 winner of the E.R. Ward Neale Medal for his sustained outstanding efforts in sharing earth science with Canadians. Dixon Edwards is recognized for his 30 years of sustained and imaginative contributions to geoscience outreach, especially his teacher workshops, field trips and public events.

Mr. Edwards is one of Canada's most innovative and ingenious interpreters of geology for the general public, and has offered imaginative and practical geological workshops and field trips to teachers, students and the general public for 30 years. He has organized and led long field trips for teachers through the plains and mountains of Western Canada, explaining glacial history, natural resources and how mountains are built.

In these trips, Mr. Edwards explains the features of the landscape and the processes that formed them, at the same time pointing out the crucial nature of Earth resources for everyday life, demonstrating a unique gift for finding ingenious ways of explaining complex natural processes. Simple examples from kitchen chemistry (recrystallization of ice cream, the metamorphism of fruit to pies), or the braided streams and deltas of debris in the gutters of suburban roads in the spring, are used to explain the principles of sedimentation to the non-geologist.

Mr. Edwards is a long-time member of the Canadian Geoscience Education Network (CGEN), and an active and enthusiastic participant in two of CGEN's core programs, EdGEO and Geoscape. His leadership, organizational and communication skills, and geological expertise have inspired many to cultivate a heightened awareness and appreciation of our planet. He has developed educational materials, ideas, presentations, guides and tours with the support and cooperation of numerous organizations, including the Royal Alberta Museum, the Royal Tyrrell Museum, the Alberta Research Council, the Geological Survey of Canada, the Geological Association of Canada, the Edmonton Geological Society, the University of Alberta, CBC TV, the Edmonton Journal, and Science & Technology Canada.

Dixon Edwards has conveyed a sense of wonder and a love of geology to receptive and captivated audiences since 1976. Through his enthusiasm and excellence in communicating geoscience, Mr. Edwards has done much to advance the GAC's goal of improving the public's perception and understanding of earth processes. His tremendous track record of achievement in geoscience outreach makes him a most deserving recipient of the E. R. Ward Neale Medal. ❖

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Left to Right: GAC Past President Robert Marquis presents the E.R. Ward Neale Medal to Dixon Edwards with E.R. Ward Neale on the right.

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Canadian Society for Unconventional Gas Conference
November 14-16, 2007
TELUS Convention Centre
Calgary, Alberta

Mineral Exploration Roundup 08
January 28-29, 2008
Westin Bayshore
Vancouver, British Columbia
Booth #F23

PDAC Convention 2008
March 2-5, 2008
Metro Toronto Convention Centre - South Building
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Earth Sciences Reports

ESR 2007-07 Regional Cross-Sections and Correlation of Subsurface Formations in the Clear Hills-Smoky River Region, Northwestern Alberta. 29.7 MB PDF. $20.00

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SPE 88 Deep Electrical Structure of the Buffalo Head Hills, Northern Alberta: Implications for Diamond Exploration. 680 MB PDF. $20.00.

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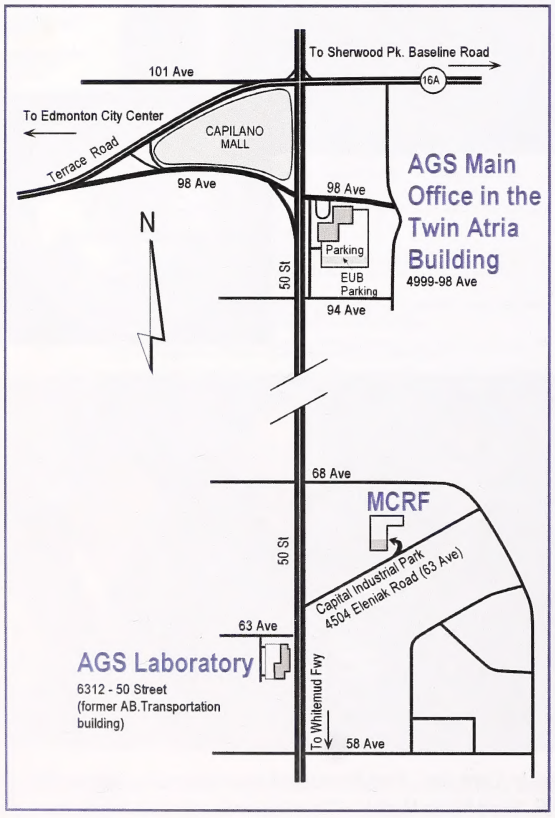

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Our Mineral Core Research Facility (MCRF) is located at
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